

# CSCI 120 Introduction to Computation

## Homework 7

### Not Given

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#### **PART 1: Operating system**

(a) Match the tasks to the appropriate components of the operating system that perform them:

- |  |   |                |
|--|---|----------------|
| Maintains a record of what is displayed on screen  | o |                |
| Performs the switching from one process to another | o |                |
| Maintains the directory system                     | o |                |
| Creates virtual memory                             | o | File manager   |
| Places new entries in the process table            | o | Memory manager |
| Performs the actual communication with I/O units   | o | Device driver  |
| Maintains a record of memory allocations           | o | Window manager |
| Protects files from unauthorized access            | o | Scheduler      |
| Executes each time a time slice terminates         | o | Dispatcher     |
| Assigns priorities to various processes            | o |                |
| Maintains a record of available mass storage space | o |                |
| Responds to mouse moves                            | o |                |

(b) Consider a word processing application and a printer such that:

- The word processing application issues requests to print page by page
- The printer only prints when it receives enough data (e.g. 1KB)

Describe a scenario that would lead to deadlock.

(c) Explain what is meant by mutual exclusion and how it is achieved by a special instruction in the instruction set of the CPU. What is such an instruction called?

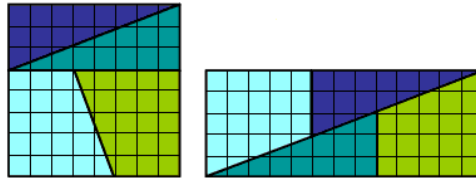
(d) What is a bootstrap and what is the difference between ROM and BIOS?

## PART 2: Fibonacci Poem

Write your own 5 line Fibonacci poem.

## PART 3: Fibonacci sequence

- (a) Write down the first 7 numbers of the Fibonacci sequence.
- (b) Divide the third number by the first number, the fourth by the second, the fifth by the third, the sixth by the fourth, and the seventh by the fifth. What do you observe? In theory what should happen if we continue?
- (c) Consider the following **wrong** proof that  $64=65$  by reusing the same shapes and counting squares. Can you explain why this happens based on parts (a) and (b)? Hint: consider the slope of each of the 4 shapes.



## PART 4: Context-free Grammar

Consider the following simplified English grammar, with  $\langle SENTENCE \rangle$  being the start variable:

$$\langle SENTENCE \rangle \rightarrow \langle NOUN - PHRASE \rangle \langle VERB - PHRASE \rangle$$
$$\langle NOUN - PHRASE \rangle \rightarrow \langle ARTICLE \rangle \langle NOUN \rangle$$
$$\langle VERB - PHRASE \rangle \rightarrow \langle VERB \rangle \langle NOUN - PHRASE \rangle$$
$$\langle ARTICLE \rangle \rightarrow a \mid the$$
$$\langle NOUN \rangle \rightarrow boy \mid girl \mid flower$$
$$\langle VERB \rangle \rightarrow touches \mid likes \mid sees$$

Draw a parse tree for the sentence “the girl touches the flower”.